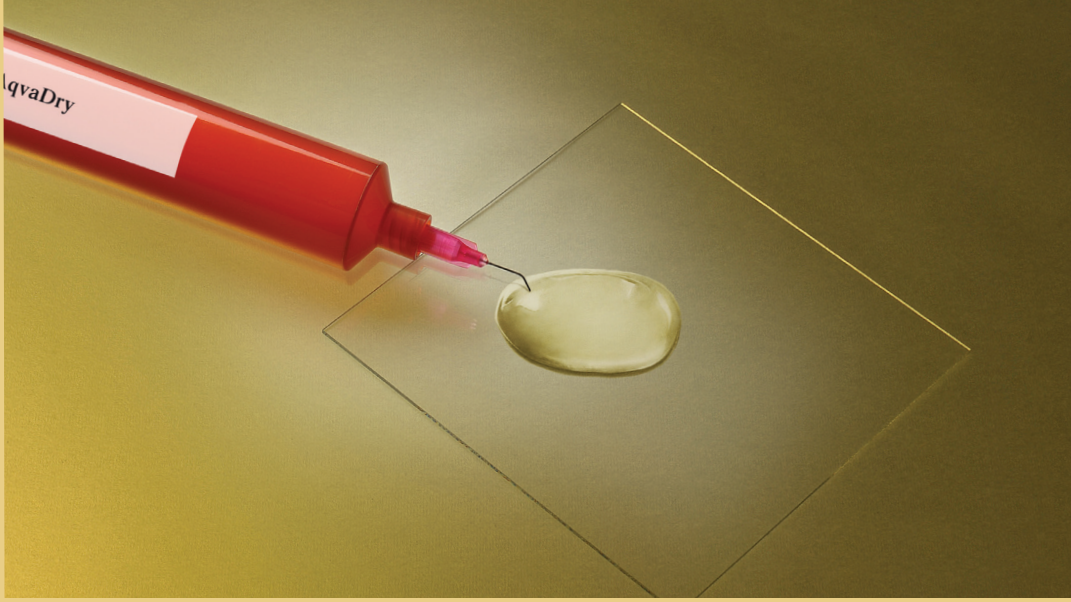
AqvaDry

Transparent Dispensable Dryer



HIGHLIGHTS

General Features

- ☐ High moisture sorption capacity to assure long life to organic devices
- ☐ The material can be used as film and filler
- ☐ Optical transparency in the visible region during and after moisture adsorption
- ☐ Compatibility with ODF production process
- ☐ Possibility of thermal and UV curing

Applications

- ☐ Active Matrix OLED displays
- ☐ Passive Matrix OLED displays
- ☐ OLED lighting systems
- ☐ Organic photovoltaic devices
- ☐ Organic sensors
- ☐ OFETs
- ☐ OLETs
- ☐ Organic lasers
- ☐ Flexible organic devices

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Product Description

AqvaDry® is a UV or thermally curable dispensable transparent dryer, designed for use in OLED and organic electronics applications. It is available in 2 formulations with different curing mechanisms, as reported in the table below:

Version	Feature
AqvaDry-U1	UV curable
AqvaDry-T1	thermally curable

Cured AqvaDry films work as transparent moisture getter.
AqvaDry must not be exposed to air; air exposure may change physical properties and therefore physical and chemical performances.

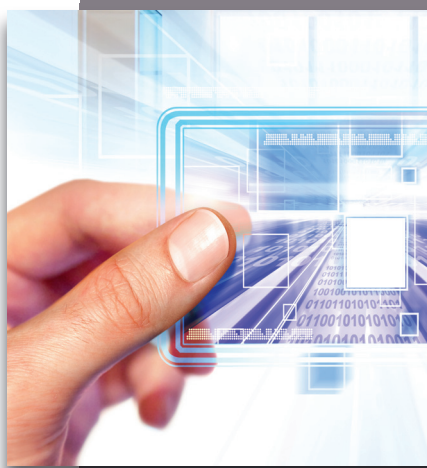
Material Property	Typical value	
	Paste	Cured Film
Appearance	Transparent	Transparent
Viscosity at 25 °C (cP)	550(*)	NA
Density (g/cm^3)	1.2	1.2
Thermal stablility at 100 °C	NA	Stable (<0.4%wt)
Moisture capacity in air (wt %)	NA	> 5
Maximum particle size (µm)	No particles	No particles
Storage temperature (°C)	2 - 5	NA
Shelf life (months)	U1: 6 T1: >3	NA
Pot life (RT, < 10 ppm H_2O) (days)	U1: >30 T1: >7	NA
Storage atmosphere	Dry air	NA

Note:
Properties of cured film may depend on curing process.
(*) at a shear rate of 5 s^{-1}

Processing

Bring AqvaDry to room temperature before use.
No mixing or stirring is required.

Deposition



Apply via screen printing, spin coating, blading, jet dispensing or dispense by syringe on the desired surface.
Regular deposition can be obtained by syringe dispensing with:

- ☐ Needle 154 micron in diameter
- ☐ Dispensing rate from 20 up to 60 mm/s
- ☐ Pressure from 1 to 3 bar

Compatible surfaces are

- ☐ Glass
- ☐ Stainless Steel and other metals
- ☐ Plastics if compatible with curing temperature (PET, PEN, engineered films)

Contact angle values recorded by sessile drop method are reported in the following table:

Substrate	Contact Angle (degree)
Glass	30.7 ± 1.6
Stainless steel	51.0 ± 2.1
PET	28.7 ± 2.1

One Drop Fill (ODF) process compatibility

Uncured material submitted to gravimetric test measurements of desorption in a UHP nitrogen atmosphere with static control of the pressure, reveals a weight loss lower than 0.2% wt after two hours at 10^{-3} mbar.

Curing conditions

- *UV Curable AqvaDry*

- ☐ Suggested curing conditions are irradiance of 100 mW/cm^2 for at least 15 seconds with 365 nm
- ☐ Irradiance higher than 500 mW/cm^2 has to be avoided
- ☐ Curing must take place in glove box (< 10 ppm H_2O)
- ☐ No outgassing is observed during curing
- ☐ No thermal post-curing is required
- ☐ Z-axis shrinkage is <8%

- *Thermally Curable AqvaDry*

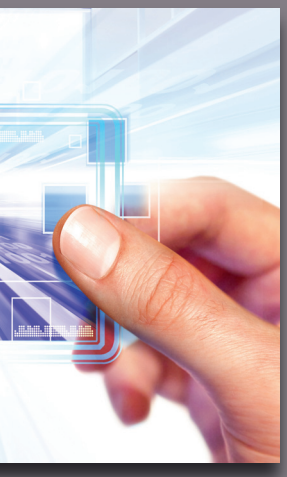
- ☐ Suggested curing conditions are 80 °C for 30 min or 100 °C for 15 min
- ☐ Curing must take place in glove box (< 10 ppm H_2O)
- ☐ No outgassing is observed during curing
- ☐ Z-axis shrinkage is <10%

Surface Roughness

Cured AqvaDry layers show very low RMS Surface Roughness (<20 nm).

AqvaDry Moisture Sorption

Calculation example
Typical sorption capacity in air: 7 % of cured weight



1cm x 1cm x 50 µm= 0.005 cm^3 x 1.2 g/cm^3 = 0.006 g= 6.0 mg
Moisture capacity = 6.0 mg x 7% = 0.42 mg

Typical weight gain at 25 °C, 55% RH on film cured in standard conditions (UV: Irradiance of 100 mW/cm^2 for 15s with Exfo Omnicure S2000 UV lamp)

Thickness (µm)	Sorption Capacity (mg cm^{-2})
20	0.17
40	0.34
60	0.50

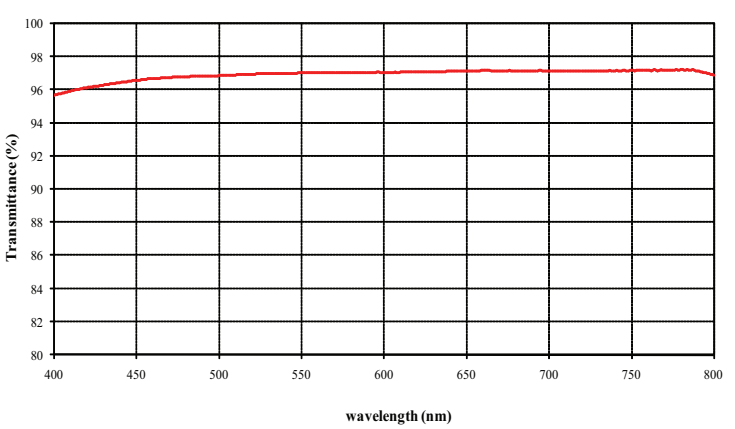
Sorption speed of a 50 µm thick film cured in standard conditions
(UV: Irradiance of 100 mW/cm^2 for 15s. with Exfo Omnicure S2000 UV lamp.)

Test conditions	Sorption speed (mg cm^{-2} min^{-1})
25 °C, 55%RH air	6.80×10^{-3}

Transparency

Transmittance > 96% for a film 100 µm in thickness.
Transparency is maintained after saturation.

Optical transmittance of AqvaDry film (100mm thick)



Mechanical Properties

Due to a glass transition temperature of 7 °C, cured AqvaDry films work as flexible moisture getters.

Cleaning

Typical solvent used for cleaning is acetone.

Shipping and Storage

Shelf life of AqvaDry-U1 is 6 months if properly stored.
Shelf life of AqvaDry-T1 is 3 months if properly stored.

Storage conditions are temperature of 2-5 °C and dry atmosphere.
AqvaDry can be stored in a normal refrigerator (not in glove box) provided that the original packaging is not open, or it is sealed in dry atmosphere.
In the event of exposure to temperature higher than 35 °C, AqvaDry must be discarded.
Turbidity could be observed if AqvaDry is stored at temperature lower than 2 °C. In this case a 5 min mixing is enough to assure turbidity disappearing.

Handling and Air Exposure

The barrier bag should be opened in glove box (< 10 ppm H_2O).
Opening in air must be avoided.
In the event of air exposure, AqvaDry must be discarded.
Before use, it must be left at room temperature for at least 2 hours, otherwise viscosity could be higher than the nominal value.
Pot life of AqvaDry-U1 is longer than 1 month.
Pot life of AqvaDry-T1 is longer than 1 week.

Ordering Information

Code: 5X0601 Description: AQVADRY-T1/B100 (Bottle – 100cc)
Code: 5X0602 Description: AQVADRY-U1/SEU10 (EFD syringe – 10cc)
Code: 5X0603 Description: AQVADRY-U1/SEU50 (EFD syringe – 50cc)
Code: 5X0604 Description: AQVADRY-U1/SMT10 (Musashi syringe – 10cc)
Code: 5X0605 Description: AQVADRY-U1/SMT50 (Musashi syringe – 50cc)

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